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### Vehicle Body Plug

The present invention relates to a plug for sealing holes in a vehicle body, comprising a central closure section and an engaging section arranged on the rim and provided for receiving portions of the vehicle body.

5 Vehicle body plugs of this type are commonly known. The plugs are meant to protect holes, which are provided in the vehicle body and are required for manufacturing the vehicle body, against humidity and corrosion. The known plugs, however, do not allow a permanent and full sealing of the holes.

10 In comparison with this, the invention provides a vehicle body plug which can be produced at low cost, is easy to install and makes possible a full sealing of the sheet metal edges also with differing plate thicknesses and various collar heights of the hole. Moreover, the vehicle body plug according to the invention can be applied prior to painting of the vehicle body as well as after it.

15 According to the invention, to this end a plug is provided for sealing holes in a vehicle body, which comprises a central closure section and an engaging section arranged on the rim and provided for receiving portions of the vehicle body, in which the closure section and the engaging section are made of a plastics material and the plastics material of the engaging section is softer than the plastics material of the closure section, and the plastics material of the engaging section being  
20 adapted to be softened by heating such that a tight connection is produced between the engaging section and the portions of the vehicle body that are received by it.

Advantageous further developments of the invention will be apparent from the subordinate claims.

Preferably, the vehicle body plug according to the invention is mounted to a vehicle body which is provided with a priming paint and subsequently will be provided with a painting and transported through a paint drying plant. It is by means of the temperature prevailing in the paint drying plant that the plug seals the hole on two sides due to the softening and, preferably, as well as due to the flowing of the soft engaging section around the edges of the hole. In the case of an application after the painting, the contact pressure exerted by the closure section on both sides on the sealing lips provided in the engaging section ensures a reliable sealing, without the engaging section being melted onto the sheet metal.

Thus, the invention guarantees a full and permanent sealing of the sheet metal edges of holes in the vehicle body, and with this a protection against corrosion.

Further advantages of the invention will be apparent from the following description of a preferred embodiment in conjunction with the attached drawings in which:

- Figure 1 is a perspective view of a vehicle body plug according to the invention;

- Figure 2 is a sectional view through the body plug according to the invention of Fig. 1; and

- Figure 3 shows a detail of Fig. 2.

The plug 10 shown in the Figures has a central closure section 12 and an engaging section 14 arranged on the rim and provided for receiving portions of the vehicle body, for instance the edges of holes or collars in the sheet metal.

The closure section 12 which here is essentially hollow cylindrical in shape, consists of a relatively hard plastics material, for instance a polyester ester elastomer having a hardness in the range of about 55 Shore D (e.g. Arnitel, available from DSM, The Netherlands). One end 16 of the hollow cylindrical closure section 12 is closed by the formation of a bottom. The opposite end 18 is open and bent outwards toward the closed end 16, forming a deepening 20 in the

region of the rim. On the bottom of the closure section 12, there is preferably formed a centrally arranged protrusion 22 directed into the hollow cylinder, this protrusion improving the mechanical strength and the ability of mounting the plug.

5       The engaging section 14 inserted in the deepening 20 in the region of the rim has an essentially U- or V-shaped cross section with two opposite side walls 28, 32 and is made of a plastics material which is softer than the plastics material of the closure section 12. A thermoplastic rubber having a hardness in the order of about 85 Shore A (e.g. Santoprene, available from Advanced Elastomer Systems,  
10   Belgium) can be for used, for example, for the plastics material of the engaging section 14. The plastics material of the engaging section 14 preferably has a melting temperature of between about 150 and 200 °C. This guarantees that, with the temperatures prevailing in usual paint drying plants, the plastics material will melt up in the region of the sheet metal edges received in the engaging section,  
15   thereby achieving a reliable sealing of the vehicle body holes.

In this case, the engaging section 14 is produced in the form of a separate insert piece and is inserted in the deepening 20 in the region of the rim of the closure section 12. The hollow cylindrical closure section 12 has a surrounding recess 24 on its outer surface; a corresponding protrusion 26 on the engaging  
20   section 14 engages in this recess. With this, there is produced a connection between the engaging section 14 and the closure section 12 in the form of an interlocking fit. However, the engaging section can also be bonded to the closure section 12 by gluing. Further, it is possible to mold the engaging section 14 integrally with the closure section 12 in an injection-molding tool, whereby a firm  
25   adhesive connection can be achieved, too.

On its side wall 28 lying against the closure section 12, the engaging section 14 further has a surrounding, laterally protruding sealing lip 30 which after installation of the plug 10 in the vehicle body hole forms a latching connection with the edge of the hole in the sheet metal. The side wall 32 lying opposite the  
30   first side wall 28 of the engaging section 14 reaches beyond the rim of the closure

section 12 and therefore forms a further sealing lip 34 which in use engages the opposite side of the edge of the hole in the sheet metal. In so doing, the closure section 12 produces a resiliently elastic pressure and, hence, presses the sealing lips 30, 34 from opposite sides against the sheet metal edges of the hole in the vehicle body. In this way a reliable sealing will be guaranteed even when the vehicle body plug 10 is mounted after painting of the vehicle body, with no melting up of the engaging section 14 in the region of the edge of the hole in the sheet metal occurring.

For application of the vehicle body plug 10 according to the invention, the plug is installed in the holes of a vehicle body provided with a priming paint. The vehicle body will subsequently be painted and transported through a paint drying plant. It is by the high temperature prevailing in the paint drying plant and the contact pressure of the hard closure section 12 that the engaging section 14, consisting of a soft plastics material, is pressed against the edge of the hole in the sheet metal from both sides and melts up in this region. The hole in the vehicle body is reliably sealed thereby; at the same time, uneven portions in the sheet metal can be leveled out to a certain extent. After cooling down of the painted vehicle body and the plug 10, and after solidification of the soft plastics material associated therewith, the edges of the hole in the sheet metal will be fully and permanently sealed. Owing to this kind of sealing, the vehicle body plug can also be used with various collar heights on a hole in the sheet metal, as well as with different plate thicknesses. In this case, too, a permanent protection against humidity and corrosion is ensured.

If the plug 10 is applied after the painting of the vehicle body and without any heating occurring, the sealing of the edges of the hole in the sheet metal will be achieved solely by the contact pressure exerted on the soft engaging section 14 by the hard closure section 12. Thus, the invention allows a double sided sealing of the edges of the hole in the sheet metal of a vehicle body both prior to painting and after painting.